Official Open-Source Publication Project Name: TRF-RgW Full Name: Thermochemical Reactor with Solid Oxide Reduction and Coupled Heat Recovery Author: Frank Robert Poppe Date of First Publication: April 19, 2025 License: Creative Commons Attribution Non-Commercial ShareAlike 4.0 International (CC BY-NC-SA 4.0) Purpose of the Publication: This document serves the purpose of freely and publicly distributing the fundamental technical concept of an energy-autonomous, solid-state reactor for hydrogen release and utilization. The goal is to make the technology accessible to all people and to prevent monopolistic patenting by third parties. Operating Principle: The TRF-RgW is a closed, modular suitcase reactor based on an autothermal redox thermoreaction. It uses: - Magnesium hydride (MgH_2) for hydrogen release via endothermic dehydrogenation. - Copper(II) oxide (CuO) for exothermic oxidation of the released hydrogen. - Thermoelectric generators (TEGs) to convert the reaction heat into electrical energy. - An integrated heat recovery and insulation system to operate the reactor autonomously over longer periods. The reaction occurs purely in the solid state and without any moving parts. The reactor only requires water to reactivate the MgH_2 - no external air supply or fossil fuels are needed. License Notice: This project is licensed under the Creative Commons Non-Commercial Attribution-ShareAlike 4.0 International License. This means: - Anyone may use, share, modify, and reproduce this concept freely. - Attribution to the original author is required. - Derivatives must be licensed under the same terms to preserve openness. More info about the license: https://creativecommons.org/licenses/by-nc-sa/4.0/ Technical Components (Excerpt): - Reactor housing (metal suitcase, insulated) - MgH_2 module (hardened, exchangeable cartridge) - CuO module (reactive bed, optionally regenerable) - Thermoelectric generators (e.g., Bi_2Te_3-based) - Insulation core & separating layers - Safety valve and thermal dissipation Disclaimer: The author accepts no liability for any damage resulting from improper use, reproduction, or modification. Handling high temperatures, hydrogen, and chemical substances requires expert knowledge and appropriate safety measures. Declaration of Intent: This document serves as the official first publication to permanently document the TRF-RgW reactor as free technology under open hardware conditions. Commercialization by third parties without disclosure of source plans and open licensing is hereby prohibited. Signed: Frank Robert Poppe April 19, 2025